

Innovation strategies for defence: the successful case of Defence Medical Services

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INNOVATION STRATEGIES FOR DEFENCE

THE SUCCESSFUL CASE OF DEFENCE MEDICAL SERVICES

MATTHEW FORD, TIMOTHY HODGETTS AND DAVID WILLIAMS

Over the past 20 years, the Defence Medical Services (DMS, the umbrella organisation for medical provision within the British armed forces) has been innovating consistently and at pace within the Ministry of Defence. The result of this sustained effort has led to progressive improvement in the outcomes of the critically injured. Separately, it has also led to global transformational innovation in support of the response to the Ebola epidemic in Sierra Leone. Through planned and orchestrated interventions across the entire organisation, from leadership to technology, medical practices to training and organisational design, the DMS can legitimately claim to have achieved a ‘Revolution in Military Medical Affairs’. Matthew Ford, Timothy Hodgetts and David Williams examine the innovation lifecycle within the DMS as it defines its response to the challenges of the changing character of conflict and consider the way defence medicine is an example to the wider military.

In September 2015, General Nicholas Houghton, then Chief of the Defence Staff, made a number of observations about the future of global security. Prominent in his list of seven themes were the constant challenge produced out of uncertainty and the growing rise of instability and threat diversification. As far as he was concerned, the question was clear: how could the UK match its limited capabilities to the multiple demands produced by a changing security environment?¹

The government's response came in November 2015 with the publication of the National Security Strategy and Strategic Defence and Security Review 2015 (SDSR).² Taking a different line to previous reviews, this SDSR made innovation a key focal point in the effort to manage contemporary security concerns. Developing innovative products

and services, the SDSR observed, is vital for maintaining an advantage over adversaries. However, more than this, innovation helps to influence industrial and strategic partners and, at the same time, promote national prosperity.

In many respects, the government's pronouncements on innovation mirror those of the US Department of Defense's third offset strategy.³ Like the US strategy, the SDSR seeks to re-fashion and apply commercial practices and off-the-shelf technologies for military technical advantage, not just for today but in preparation for future threats. For the UK, just like its transatlantic counterparts, this recognises that the 'private sector, not governments' now drives the pace of technological change.⁴ This not only reflects fiscal realities, but also the fact that the private sector is now investing more in research and development than

the public sector. In 2014, for instance, the top 20 global companies had a combined research and development budget of more than £100 billion.⁵ With the private sector shouldering the burden of the global research effort, the Ministry of Defence (MoD) needs to find ways to redirect and leverage these investments through partnering with industry. Thus the SDSR focuses on Defence Growth Partnerships and Security and Resilience Growth Partnerships with the intention of bringing together the UK's universities, small and medium-sized enterprises and start-ups to develop collaborative and commercially aware approaches to risk, investment planning and project management.

When it comes to delivering on the ambitions set out in the SDSR, however, there is still a great deal that needs to be defined. This includes: how to transform military organisations; how to embed



Naval Nurse Sarah Butler and Medical Assistant Georgina Francis treat an injured soldier at Camp Bastion's field hospital in Helmand province, Afghanistan, February 2009. Courtesy of PA Images/Katie Dawson

and sustain public sector transformation through harnessing private sector investments; and how to deliver solutions that produce more than short-term and costly technology adaptations. The task of this article is, therefore, to sketch out how an innovation strategy might be operationalised so that the MoD might optimise its investment decisions. In this respect, the article considers the experience of the Defence Medical Services (DMS) and attempts to show how successful innovation might be more widely exploited in a British military context.

Defence Medical Services: Long-Term Innovation Enables Short-Term Adaptation

The DMS has achieved outstanding clinical results which some have described as constituting a 'Revolution in Medical Military Affairs'.⁶ Not only have these successes sustained the moral component, further enabling momentum on the battlefield, they have also underlined

the government's commitment to the Armed Forces Covenant.⁷ Despite the increasing severity of wounds over the course of the Helmand campaign, the unexpected survival rate significantly surpassed that of the National Health Service (NHS). As a result, soldiers and their commanders understood that if they 'got into trouble' everything that *could* be done to guarantee their survival and future welfare was being done.⁸

However, achieving these successes has been hard won. Only through 20 years of continual performance improvement at all levels of the organisation, spanning technology to governance, has the DMS put itself at the forefront of clinical results both in terms of military and civilian medical practice. Indeed, it was stated by the Healthcare Commission, one of the three organisations that make up the Care Quality Commission, that there is much the NHS can learn from the DMS.⁹ Key to this has been the balancing of long-term innovation cycles against the

demands produced by rapid deployment and the requirement to adapt to the changing operating environment. No greater example has been the innovations in organisation, technology, training and clinical practice to support the transformation of a field hospital to manage Ebola patients in Sierra Leone.¹⁰

In terms of battlefield success, the foundation for the DMS's Operational Patient Care Pathway is based on three mutually supporting pillars.¹¹ In the first instance, there has been a conceptual revolution in patient care. Central to this was the recognition that catastrophic haemorrhage from limbs has been a major cause of avoidable death on the battlefield.¹² Establishing the evidential base in support of this conclusion has taken time and scrutiny of historical conflicts. The new concept meant breaking away from established civilian practice of trauma care that emphasised 'airway, breathing and circulation'. Making this change was disruptive and was met with

internal resistance.¹³ Having made the conceptual break, a number of doctrinal, organisational and training challenges needed to be overcome. Advances in pre-hospital emergency care capability were needed to ensure that the casualty made it from the battlefield to the field hospital alive. In Afghanistan, the most tangible signs of these changes were the first aid equipment carried by every soldier, the introduction of the army team medic and enhancements to the airborne Medical Emergency Response Team (MERT) to secure and stabilise the casualty as they made their way to Camp Bastion.

MERTs and battlefield medics by themselves do not represent particularly revolutionary practices. The concept of bringing emergency medicine to the front line had precedents in the Incident Response Teams of the 1990s.¹⁴ Battlefield medics had antecedents in the 'buddy system' developed by US Special Forces in Vietnam.¹⁵ When reimagined through the lens of catastrophic haemorrhage, however, prevention of blood loss became the driving concern for those involved in pre-hospital care. New technologies that prevented blood loss could be put into service. Old technologies, some of which had previously been dismissed as counterproductive, could be reconsidered. Thus, even as battlefield medics and MERT personnel made greater use of pelvic binders and compression and haemostatic dressings, older, more soldier-proof technologies such as tourniquets, could be used in the knowledge that this would increase survival.

Enabling the conceptual revolutions nevertheless depended on clinical doctrine, the second pillar of the Operational Patient Care Pathway. In this respect, a key enabler for change – one based on a much longer innovation trajectory – was the work of then Colonel Ian Haywood, who in the late 1980s developed a military equivalent to civilian Advanced Trauma Life Support practices.¹⁶ It was initially known as British Army Advanced Trauma Life Support but then became known as Battlefield Advanced Trauma Life Support (BATLS) when medicine became a concern for all branches of the armed forces. BATLS codified trauma care, repeatedly demonstrating its value in Operation *Granby* – the name given to

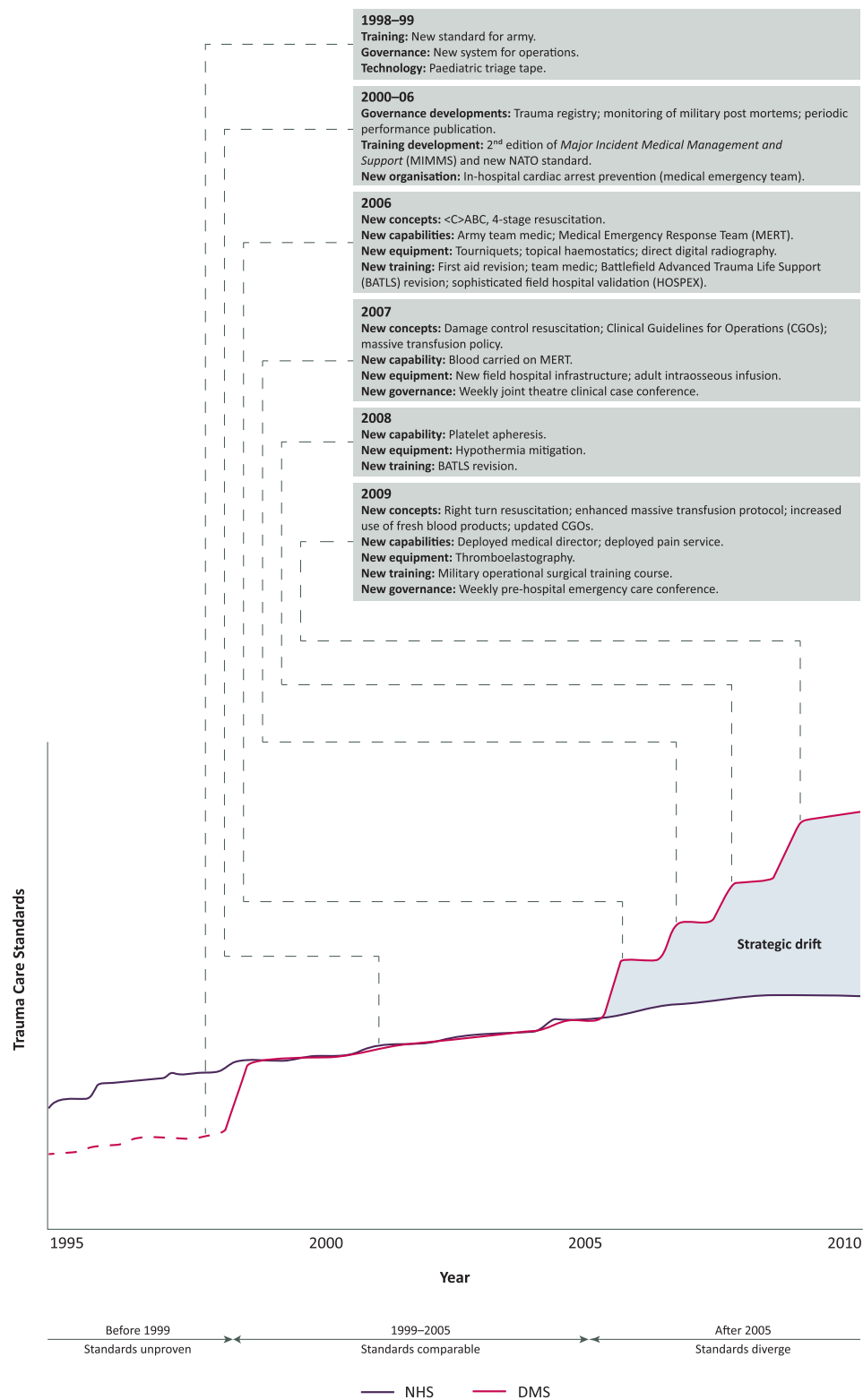
British military operations in the 1991 Gulf War – and during mass casualty situations in the Balkan conflicts.¹⁷ BATLS provided a framework for thinking about trauma care from battlefield to field hospital, retaining its use even as various aspects evolved due to a changing approach to haemorrhage.¹⁸

If BATLS provided a common language for thinking through the military response to trauma, then it took the final pillar of the Operational Patient Care Pathway to provide the means through which transformative change was made possible. Here, the challenges were concerned with organisation, medical governance and technology. As discussed below, some of these changes were imposed from outside the DMS, some were a response to budgetary pressures and others came from an effort to optimise performance.

In the first instance, the Strategic Defence Review 1998 reorganised the DMS, further centralising and integrating the single service medical components under the surgeon general.¹⁹ At the end of the Cold War there were fourteen British military hospitals dispersed across the country and each of the services had separate centres of academia and clinical excellence. The peace dividend cuts of 1994 forced a rethink and led to the closure of all but one military hospital and the dispersal of military clinicians to five NHS hospitals. By 1997, the Defence Select Committee was questioning whether the DMS could continue to exist.²⁰ In response, the DMS decided to more actively partner with the NHS and open a centre of academic and military medicine at what would become the Royal Centre for Defence Medicine (RCDM) at the Queen Elizabeth Hospital Birmingham. Originally, the RCDM was at Selly Oak NHS Trust Hospital, where it officially opened in 2001. Although there were initial problems managing military personnel within an NHS context, these challenges were overcome. The net effect of these reforms did not produce what some theorists of military-technical change sometimes characterise as either top-down or bottom-up innovation. Instead, they resulted in the RCDM generating the expertise to drive change in military medicine from the middle out.²¹

In terms of clinical governance, the need to use the RCDM to institutionalise change was brought to a head in 2003. During a class action brought by nearly 2,000 former British military personnel suffering from post-traumatic stress disorder, the High Court judge, Justice Owen, questioned whether the DMS had been negligent in keeping abreast of the developing state of knowledge in psychiatric care.²² Although the case was eventually dismissed, the censure led to the implementation of new national clinical guidelines underpinned by technologies that enabled the effective collection and analysis of medical data through the much expanded Military Trauma Registry. The goal was to implement a clinical governance model that emphasised quality assurance.²³ This in turn was supported by the greater use of a peer-review framework established at the RCDM designed to evaluate the number and reasons for unexpected survival and to analyse every operational trauma death. In the process, the RCDM became the fulcrum around which a shared DMS culture could establish itself. This culture was tolerant of and founded on a systematic and constructive process of rigorous self-criticism and analysis.

These long-term innovations ensured that the DMS was ready to field medical personnel to Afghanistan and Iraq. More than this, however, these changes produced a degree of organisational resilience that made it possible for the DMS to rapidly respond, test and disseminate change and adapt to the necessities produced out of battle. Thus by 2007, Joint Theatre Clinical Case Conferences oversaw a revised and expanded Joint Theatre Trauma Registry, which made it possible for rear-echelon and in-theatre medical practitioners to coordinate their treatment plans, ensuring that clinician decision-making and casualty information were in lockstep as wounded soldiers were taken from the battlefield to treatment in Birmingham.²⁴ When supported by peer review and analysis undertaken at the RCDM, decisions taken in field hospitals could be assessed and further optimisations and interventions made. By 2009, it became clear that the managerial burden produced by the changes to medical doctrine concerning damage control resuscitation,²⁵ rapid

Figure 1: Major Developments in Trauma Care Standards in the DMS and NHS since 1995

Source: Authors' own work.

evacuation, aeromedical transportation home (C17A Globemasters equipped as flying hospitals) and working within an inter-disciplinary and international military

context was too great. Consequently, the DMS deployed a medical director to Camp Bastion so that the clinical director could remain focused on patient care

and maintaining quality assurance.²⁶ Further institutionalised through military operational support training and hospital macro-simulation exercises, it is only

through a combination of multiple long-term and short-term interventions that truly transformational results have been made possible.

Understanding the Need: From Adapting to Change to Disrupting the Organisation

The DMS has innovated itself by continually investing in practices, infrastructure and technologies that have the potential to bring long-term benefit in patient care. However, not all of these changes have necessarily fallen into preplanned patterns following centralised directives. In some instances – notably those associated with organisation, clinical governance and technology – budgetary pressures and grand strategic decision-making disrupted existing DMS business. At the same time, battlefield experience has offered continual opportunities to test, refine, improve and reject methods, techniques and technologies depending on how they affect patient care outcomes. In the case of long-term investment, external, unplanned and otherwise disruptive change has enhanced the capability of the DMS through the creation of the RCDM and focusing on quality. In terms of battlefield necessities, the prior preparations put in place by the DMS ensured that the organisation could rapidly adapt to the immediate and challenging circumstances generated by war.

However, it would be inaccurate to describe this disruptive change as institutionalised within the DMS in a similar manner to that advocated for commercial organisations by Clayton M Christensen in his work *The Innovator's Dilemma*.²⁷ Disrupting the DMS has not been a market-led activity. Rather, the kinds of innovation this article describes have been based on changes that have been prescribed by and implemented through the public sector. Indeed, much of the innovation that has emerged from the DMS has depended on enablers that have their basis in academic clinicians whose defence medical professorships are rooted in their NHS practices.

The kinds of disruptive change this article discusses, therefore, need some further explanation if a case is to be made for finding ways to embed processes of innovation within the DMS

such that the organisation can continue its transformation trajectory. In this respect, the authors assert that the ability of the DMS to prepare for future conflicts and emergencies will come through harnessing the opportunities that the state can provide to the private sector to test and embed disruptive innovation. This approach has more in common with the findings of Mariana Mazzucato, who observed that the public sector has regularly invested in fledgling innovations and in the process incubated entirely new markets.²⁸

Thus, the question facing the DMS – indeed the question facing the whole MoD – is how to plan for and manage disruptive changes even as the organisation optimises its capacity to make adaptations in war. All future operating contexts and demands placed on the DMS cannot be known, but plans can be devised for the kinds of long-term investment that can ensure the entrepreneurial state helps to sustain adaptation. Given industry's increasingly large R&D budgets, it is clear that rapid experimentation will be enabled through collaboration with it. Putting in place principles of engagement that manage the structure of risk and reward while resolving procurement and supply chain challenges will enhance the DMS's ability to adapt rapidly. Finding ways to align DMS requirements with industry's ambitions to develop broad markets may involve procurement-linked projects under the Small Business Research Initiative to help jumpstart opportunities. Urgent Operational Requirements (UOR) represent an established route for resolving battlefield imperatives. What this article proposes, however, are processes and mechanisms that will accelerate the development of solutions that cannot yet be accommodated by the UOR system and cannot be provided through the public sector.

To do this effectively, the DMS will need to clarify the relationships it has with the NHS to ensure that innovation in defence produces longer-term benefits for the public. At the same time, the UK needs to accept that the NHS is not geared up to innovate as quickly as the DMS, given the complex military and emergency relief challenges the military faces and the acknowledged role of defence medicine as a first mover in innovation. The clinical

demands of defence thus lend themselves to working closely with industrial partners in new medical technologies, but only on the basis that the DMS can define its business requirements clearly. Generating that clarity will demand proper horizon scanning, mapping research interventions against potential payoffs for industry and the NHS, and aligning innovation with the regulatory regime and ethical considerations that frame research. Some of the infrastructure to deliver on this agenda is already in place with the aggregation of UK defence medicine assets in the Midlands. These assets will be further enhanced following the opening of the Defence National Rehabilitation Centre, on the Stanford Hall estate in Stanford-on-Soar near Loughborough, in 2018. The DMS now needs to move quickly to capitalise on this alignment, thereby turning the transformations of the past 20 years into enduring change that will benefit defence over the next two decades. In particular, the DMS now needs to take the lead and help create a med-tech incubator to solve contemporary defence medical challenges and at the same time lead the way on med-tech for industry and the NHS.

Payoffs and Challenges

Sustaining the transformation in the DMS thus depends on multiple value propositions for various constituencies and careful capture and communication of defence medicine requirements. Industrial partners need to know that their investment will lead to commercially viable innovations. Commanders will rightfully want to know that their soldiers are being properly looked after. Soldiers will want to know that they are not just guinea pigs for industry but rather the focal point for delivering quality healthcare. The country will want to see high standards being maintained and taxpayers will want to see returns on any investment they make. Putting in place a carefully managed innovation incubator that delivers on these opportunities will require care, business acumen and a great deal of effective leadership. However, the potential benefits that the DMS can generate by working with industry warrant the investment of time and energy.

Challenges to fulfilling the potential payoffs will nevertheless remain. There needs to be a certain degree of realism in the way that meaningful innovation challenges are formulated. Technology bottlenecks need to be accounted for and the interfaces between multiple disciplines and stakeholders will be challenging. Technical issues will demand careful testing and validation to guarantee sponsor engagement. Commercial, clinical and military cultures are different and will consider questions of risk, certainty and resilience differently. Moreover, the private sector, the MoD and the armed forces themselves have different hierarchical structures and attitudes towards bureaucracy. The Defence Science and Technology Laboratory (Dstl) provides a mechanism for reconciling some of the challenges a DMS med-tech incubator might produce. However, this will be possible only if all stakeholders recognise the strategic benefits that can be realised from everyone working together.

Conclusion

Nicholas Houghton was clear in his assessment of the future security environment. Threat diversification and instability are becoming major challenges for the UK and its NATO partners. In recognising this broadening of the security agenda, the government's response has developed along several axes. For the first time, however, the SDSR has explicitly described innovation as a central plank in the government's set of policy responses.

This article has shown that transformative innovation within defence medicine has been ongoing for some time and with remarkable success. Consequently, government policy in relation to UK defence has some foundation in the successful experience of the DMS. Soldier survival and unexpected survival rates have been well in advance of the NHS to the extent that DMS is now recognised to be a centre

of world-leading trauma-care specialists. The DMS is well placed, therefore, to offer the benefits of its innovation know-how to the rest of the MoD.

Nonetheless, the DMS recognises that if it is to further embed, sustain and take advantage of the propitious circumstances it has created for itself, it must continue to embrace the innovation agenda that the government set out. The DMS is confident of its ability to embrace innovation as a core consideration in its change agenda and in this respect it has already started to define and put in place effective networks and structures to facilitate the creation of an innovation incubator. This organisational device will allow the public and private sectors to share risks and rewards in ways that will benefit everyone.

The DMS has already demonstrated a degree of entrepreneurialism. Central directives and disruptive challenges have in part set the framework for organisational change. However, the energy for steering innovation has been dependent on the RCDM and the evidential base supplied by academic clinicians, who have driven transformation from the middle of the organisation. In the future, if the DMS is to be ready for everything from Ebola to terror attacks, and disaster relief to war, then it must further exploit its unique capabilities through investment in new and existing partnerships. The potential to deliver significant benefits for industry, the public good and for soldiers is too great an opportunity and ought not to be missed. ■

Matthew Ford is a senior lecturer in International Relations at the University of Sussex. He has a PhD in War Studies from King's College London and is an Honorary Historical Consultant to the Royal Armouries, a former West Point fellow and a founding editor-in-chief of the British Journal for Military

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Timothy Hodgetts is a brigadier who trained as a general physician and then progressed to higher training in emergency medicine. He has a PhD in Public Health, master's degrees in Medical Education and Business Administration and is a chartered manager. He graduated from the Joint Command and Staff College in 2011. He has served on operations as a practising emergency physician in hospitals in Northern Ireland, Kosovo, Oman, Afghanistan (three tours), Kuwait and Iraq (four tours). On six of these tours, he was appointed the hospital's medical director, including the multinational Danish–UK–US hospital in Afghanistan in 2009. From 2011–13, he was the medical director within NATO's Allied Rapid Reaction Corps, and from 2014 has been the medical director for the UK Defence Medical Services.

David Williams is Professor of Healthcare Engineering at Loughborough University. He has held senior leadership positions in academia and industry, working for much of his career at their interface and in healthcare since 1999. Current research addresses manufacturing and regulatory science of clinician-pulled, cell-based therapies and opportunities for engineers within defence medicine. David serves on a number of key UK and European funding committees for the translation of medical technologies. He was made a Fellow of the Royal Academy of Engineering (FREng) in 2002 and an OBE in 2014.

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